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An Overview of Activities in the Area of Inter-firm Cooperation
A Progress Report

UNCTAD Divisional Paper

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PREFACE

The Commission on Enterprise, Business Facilitation and Development at its first session (Geneva, 20-24 January 1997) recognized the need for further analytical work and policy research within UNCTAD on the element of enterprise development strategies, including an exploration of the possible value as well as the ways and means of promoting and facilitating effective inter-firm cooperation through clustering, networking and technology partnership, both domestically and internationally. The Commission requested that the secretariat begin analytical work and policy research on this subject with an overview of work already done.[1]

Parts I and II of this paper respond to this request by providing a brief overview of existing research on clustering, networking and technology partnerships. This review illustrates the lack of analytical and policy-oriented work on inter-firm cooperation involving firms from developing countries and the limited attention paid to the needs of the enterprise sector in developing countries and to small and medium-sized enterprises (SMEs). Part III endeavours to synthesize some policy issues related to the promotion of inter-firm cooperation as a means to foster the development and competitiveness of enterprise. It also identifies a number of other issues for further exploration and action.

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[1]See UNCTAD, Report of the Commission on Enterprise, Business Facilitation and Development on its first session (TD/B/44/2 - TD/B/Com. 3/4), annex I, paragraphs 3(ii) and 5.

INTRODUCTION

Cooperation between firms has become an important tool in facing the pressures of increasing global competition, and in enhancing technological capability and innovativeness. Such cooperation takes place not only between firms from developed countries, but also in the context of North-South and South-South inter-firm relations and between firms located in the same country as well as those located in different countries. Collaboration among firms may also take a variety of different forms ranging from strategic alliances to technology partnerships, incubators or technology poles', knowledge networks, licensing, franchising, and to vertical or horizontal subcontracting. Collaboration may involve firms in close proximity to each other, such as those located in growth triangles', or those which have clustered in specific locations overtime. Inter-firm collaboration is undertaken for a number of reasons: sharing of know-how, joint action, building technological capacities, taking advantage of local marketing skills, decentralizing to be closer to local markets, building user-supplier networks, and taking advantage of knowledge spillovers from location-based proximity. For the purposes of analysis of such inter-firm cooperation activities, this report takes into consideration three broad categories of such cooperation: clustering, networks and strategic partnerships. Technically speaking, clustering is a spatial concept and does not automatically imply collaboration among the firms so located. Clustering, however, does appear to have a positive impact on enterprise development and the role that inter-firm collaboration plays in this process needs further study. Networking is most often used to describe arms-length interactions between firms such as sub-contracting relationships. Many of these are now developing into full-scale partnerships. Traditional inter-firm relationships, such as licensing agreements, are also developing into newer forms of technology partnerships.[2] In this paper we differentiate traditional one-way relationships from newer two-way partnerships, referring to the latter as strategic partnerships.[3]

Since the 1980s, inter-firm cooperation of all sorts has been rapidly increasing and has been taking place on a basis that is more and more cross-national in nature. This development is partly in response to the emergence of "knowledge-based production" and to the processes of economic liberalization, and globalization, accelerated by technological advances in information and communication technologies, which in turn have been increasing the pressures of global competition. It is particularly significant in industrialized countries and advanced developing countries. There are, however, wide differences in the readiness of enterprises from the developing countries to face the challenges of global economic integration.[4]

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[2]See UNCTAD (1995). Technological Capacity-Building and Technology Partnership: Field Findings, Country Experiences and Programmes (UNCTAD/DST/6); UNCTAD (1996). Emerging Forms of Technological Cooperation: the Case for Technological Partnership (UNCTAD/DST/13); UNCTAD (1994). Exchanging Experiences of Technology Partnership - the Helsinki Meeting of Experts (UNCTAD/DST/15).

[3]See Mytelka, L.K. (1991). *Strategic Partnerships: States, Firms and International Competition*, Pinters Publishers Ltd., London.

[4]Dohlman, E. and Halverson-Quevedo, R. (1997). "Globalization and Development", *The OECD Observer*, No. 204, pp. 36-39.

Enterprise clusters, networks and strategic partnering do not take place in a policy or institutional vacuum. The process is brought about and mediated partly by the operation of powerful, in-built mechanisms in product and factor markets. Partly it consists of wide-ranging functional and selective assistance, steerage and nudging coming over time from deliberate economic and social policy. Indeed, various components of such government intervention are sequenced to unleash as well as strengthen market forces.

I. Patterns of inter-firm cooperation

A. Clustering

Clusters and agglomerates of firms may or may not involve formal partnerships between spatially proximate firms. They are thought to facilitate access to externalities/public goods such as water, electricity, and the right kind of labour force. Other positive effects of clustering include "emulation", "tacit knowledge transfer" and lower transaction costs as trust builds up and/or through the ease of transaction that comes from "social proximity".[1] A cluster, grouping a number of small enterprises, can have two organizational objectives. The first is a geographical one, having a cluster of enterprises within close proximity which facilitates the production process, especially in cases where the firms are producing the same goods, allowing for a strategy of labour division. The second objective and possible end-result of this cooperation is that firms producing the same goods and clustered together may now compete with larger enterprises, for example, in a consortium. Clusters characterized by this division of labour can be defined as *industrial districts*. It is possible to describe industrial districts as locally coordinated and well-articulated economic systems, normally specializing in one product, which is characterized by the division of duties between firms with the firms gaining all the benefits and economies of spatial agglomeration.[2] A critical element in the continued growth and innovativeness of enterprises in industrial districts are policies and programmes developed and/or promoted by local governments.[3]

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[1] See: Malmberg, A. and Maskell, P. (1996). "Proximity Institutions and Learning - Towards an Explanation of Regional Specialization and Industry Agglomeration". Paper presented at the First Meeting on "Learning and Embeddedness: Evolving Transnational Firm Strategies in Europe", Durham, United Kingdom, 28-29 June; Saxenian, A. (1994). *Regional Advantage. Culture and Competition in Silicon Valley and Route 128*. Cambridge, MA and London, Harvard, University Press; Scott, A.J. and Storper, M. (1992). "Regional Development Reconsidered" in Ernste, N.F. and Meier, V. (eds.), *Regional Development and Contemporary Industrial Response*, London: Bel Haven.

[2] Porter, M.F. (1990). "The Competitive Advantage of Nations", Macmillan, London and Basingstoke, p. 203. See also Pyke, F., Becattini, G. and Sengenberger, W. (1990). "Industrial Districts and Inter-firm Cooperation in Italy", ILO Publications, London; and UNCTAD, "Technological Dynamism in Industrial Districts: An Alternative Approach to Industrialization in Developing Countries?" Papers and synthesis of discussions of a Symposium on Industrial Districts and Technology (UNCTAD/ITD/TEC/11).

[3] Piore, M.D. and Sabel, U.F. (1984). *The Second Industrial Divide: Possibilities for Prosperity*, New York, Basic Books.

Clusters are sector specific (vertical specialization) or market specific (horizontal specialization). A sector-specific industrial cluster involves cooperation between vertically specialized firms, e.g., collaboration between small firms, or subcontracting between small and large firms. Horizontal specialization involves collaboration between small firms in order to meet the demands of a large order. The market-specific cluster groups traders and small-scale producers in a central place, allowing them to co-locate mainly to exploit agglomeration economies, and attract more customers. In both cases collective efficiency,[8] e.g., in terms of a major motivation for companies to work together, concentration on critical competencies, obtaining ownership and internalization advantages and exploiting locational advantages and synergies may be achieved, for example by reducing transaction costs with customers.

While such clusters (industrial districts) are mainly formed without government intervention, in many cases governments have intervened to foster and sustain them in order to realize the agglomeration effects and build up competitiveness and the technological capabilities of their domestic firms.

B. Networking

Networking most often is used to describe arms-length interactions between firms. The term describes both international and national production as well as distribution networks; it includes interaction across a value chain without the necessity of having either formal links or equity participation and does not require proximity. Both networks of small firms and international production networks organized through subcontracting and/or foreign direct investment (FDI) by transnational corporations (TNCs) are included in this category. While they do involve transaction costs, networks enable firms to share risks and costs and to access markets. Anticipated reduction in production costs as well as considerations of market penetration and market power are key elements in the firm's decisional matrix. Networking links small, medium and large enterprises by an exchange of information (for example of a technological or marketing nature), commercial relationships (between suppliers and customers) and competition relationships, in order to develop a responsive organization or production system. The main characteristic of a network is that it does not require geographical proximity to be efficient: it can link firms whose activities are around the world.

Networking as a means for firms to help and support themselves is based on the idea that contracts and cooperation with other firms are a beneficial way for them to overcome problems and that external links or some form of brokerage could facilitate this mutual process.[9] Joint projects that follow a networking approach can create a new set of products, gain access to new

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[8] Schmitz, H. (1997). *Collective Efficiency and Increasing Returns*, March, IDS Working Paper 50.

[9] See, for example, Amin, A. and Thomas, D. (1996). "The Negotiated Economy: State and Civic Institutions in Denmark", in *Economy and Society*, vol. 25, No. 2, May, pp. 255-280; Malmberg, A. and Maskell, P. (1996). *Proximity, institutions and learning. Toward an explanation of regional specialization and industry agglomeration*. Paper presented at the first workshop on "Learning and Embeddedness: Evolving transnational firms strategies in Europe", Durham, UK, 28-29 June.

markets or to the development of new productive processes, which a firm may not have been able to achieve on its own. Three kinds of networks have been observed: horizontal ones (for sharing of the R and D burden, the costs of expensive equipment) which are aimed at the conception of a new project, or the launching of some activity, and the vertical ones which are aimed at finding complementary activities in the development of a new product, and finally the knowledge networks, which are associations "geared to solving a common problem or exchange technology or market information".[10]

In recent years, both in the economy and in policy-making, the inter-firm networking phenomenon is becoming more prominent. The structure of the economy may in fact have become increasingly network like.[11] The distinguishing mark of the large technical systems that have developed in the fields of transport and telecommunications, in water and in energy provision, is their network character. These networks produce collective goods for instance through cooperation in R and D, training and information sharing.[12]

Local systems of small and medium-sized enterprises (SMEs) have also been defined as a grouping of firms specialized in various complementary functions, interacting and collaborating by pooling services, training, technology diffusion and export-promotion among themselves. They can be formal and informal networks providing services and markets. A very competitive environment can be created characterized by skilful labour, education attainment, ability of adequate supplies of sites, finance and the existence of informal relations and, finally, transaction based on trust and convention. The network system makes possible economies of scale but above all it is considered as a system of learning and organizing that arises through interdependence and mutual exchange between firms.[13]

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[10]Arzeni, S. and Pellegrin, J.P. (1997). "Entrepreneurship and local development", *The OECD Observer*, February-March, pp. 27-29.

[11]Hollingsworth, R.J. (1990). "The governance of American manufacturing sectors: the logic of coordination and control". MPIFG Discussion Paper 90/4. Köln: Max-Planck-Institut für Gesellschaftsforschung".

[12]Mayntz, R. (1993). p. 4. "Modernization and the logic of Interorganizational Networks. Knowledge and Policy", in *The International Journal of Knowledge Transfer and Utilization*, Spring, vol. 6, No. 1. pp. 3-16.

[13]Ibid.

Box 1

Networking in Africa

In Africa, industrialization to date has occurred in three main fashions. One of these evolved around public-sector enterprises and subsidiaries of multinational corporations. A second form has taken place through the increased sophistication of small and micro-enterprises of an "informal" form. Prominent differences in capital investment, technological refinement and degree of operation have developed between the sectors, which have emerged through each of these forms of industrialization. Third, an intermediate sector has evolved through either gradual mechanism of small enterprises or efforts of private entrepreneurs who have initiated small manufacturing enterprises, which are partially or fully mechanized from the outset. These intermediate enterprises are most often flexibly organized and are segments of extremely adaptable enterprise networks. Often the capacity of local producers of tools and machinery to provide appropriate equipment to small and medium-sized firms depends on local social networks, which develop through cooperation among firms as well as the acquisition of technical experience and skills. This phenomenon has been observed, for example, in the light engineering sector in the region near Accra, Ghana.

Sources: van Dijk, M.P. and Rabellotti, R. "Clusters and Networks as Sources of Cooperation and Technology Diffusion for Small Enterprises in Developing Countries" (1997) and Sverrisson, A., "Enterprise Networks in Technological Change; Aspects of Light Engineering and Metal-Working in Accra". Both in van Dijk, M.P. and Rabellotti, R. *Enterprise Clusters and Networks in Developing Countries*, London, 1997, Frank Cass.

C. Strategic partnerships

Though there is no single definition for strategic alliances or interfirm technology cooperation agreements,[14] when characterizing them it is usually stressed that (a) they are two-way relationships focused on joint knowledge production and sharing as opposed to a one-way transfer of technology; (b) they tend to be contractual in nature with little or no equity involvement by the participants and when such partnerships include an equity arrangement, the intent is less to exercise management control than it is to help finance the partner firm's share of joint R and D activities; and (c) they are part of the longer-term planning activity of the firm rather than

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[14] For example, Mowery, D. C. (1992). "International Collaborative Ventures and US Firms' Technology Strategies", in O. Granstrand, L. H. Kanson and S. Sjolander (eds.), *Technology Management and International Business: Internationalization of R&D and Technology*. John Wiley & Sons Ltd. Sussex, United Kingdom, pp. 209-249; Teece, D. J. (1992). "Competition, Cooperation and Innovation: Organizational Arrangements for Regimes of Rapid Technological Progress", in *Journal of Economic Behaviour and Organization*, vol. 18, pp. 1-25 and Vonortas, N. S. and Safioleas, S. P. (1997). "Strategic Alliances in Information Technology and Developing Country Firms: Recent Evidence", *World Development*, vol. 25, No. 5, pp. 657-680".

simply an opportunistic response to short-term financial gain.[15] Strategic partnerships are not about the statics of allocative choices but about the dynamics of innovation and competition. Alliances are regarded as strategic when they seek to improve the future competitive position of the firm. In the majority of cases, particularly when it concerns firms from developed countries, strategic partnerships involve R and D, though this is not the only subject of collaborative activity and production and marketing becoming increasingly prominent. The majority of studies on inter-firm cooperation place great emphasis on technology generation.[16]

Inter-firm agreements taking the form of strategic partnerships, with or without equity exist at all stages in the value chain from R and D to production to marketing/distribution. Traditionally such agreements were one-way - as in licensing agreements or franchising. More recently two-way partnerships have also emerged. They are designated "two-way" because they involve knowledge production and sharing as in R and D partnerships or modularized production where those producing the modules share in the design of component parts of the final product or joint marketing. Partnerships of this sort involve risk and cost sharing and considerations of market access and power. They also imply mutuality - in the sense that beneficent contributions emanate from both partners, meaning that they have something important to offer to each other. They have the advantage of ensuring greater flexibility to respond to change and stimulate innovation through interaction.

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[15]Mytelka, L. K. (1991). "Introduction", in Mytelka, L.K. (ed.), *Strategic Partnerships and the World Economy*, London, Pinter Publishers, p. 1-2.

[16]O'Doherty, D. (1990). "Strategic Alliances - an SME and Small Country Perspective", *Science and Public Policy*, vol. 17, No. 5., pp. 303-310. See also, for example, UNCTAD's work on technology partnership: (UNCTAD/DST/13) Emerging Forms of Technological Cooperation: The Case for Technology Partnership, and (UNCTAD/DST/15) Exchanging Experiences of Technology Partnership. *The Helsinki Meeting of Experts.*

Table 1

Taxonomy of inter-firm agreements

	R and D	*Production*	*Distribution*
One-way relationships	licensing; cross-licensing; early efforts to commercialize public sector R and D.	sub-contracting; original equipment manufacturing; acquisition; joint ventures.	franchising
Two-way partnerships	R and D consortia; customer-supplier networks; inter-firm technology collaboration agreements; university-industry partnership.	co-production; use of common components; modularization; joint venture; new forms of subcontracting.	joint marketing; system-products; standardization of interfaces.

Source: Mytelka, L.K. (1993). "Strategic alliances", in: C.J. Maule and F.O. Hampson (eds.), *Canada among Nations 1993-1994: Global Jeopardy* (Ottawa, Carleton University Press), pp. 106-130; here: p. 109.

Cross-border inter-firm cooperation involving joint ventures, licensing, subcontracting, franchising, marketing, manufacturing, R and D and exploration agreements have increased from 1,760 in 1990 to 4,600 in 1995.[17] While most of these agreements involved firms from the European Union, Japan and the United States, firms from developing countries have increasingly become involved with a number of new agreements involving their participation, increasing from 440 in 1990 to 2,120 in 1994, falling to 560 in 1995.[18] As far as strategic R and D partnerships are concerned, their share increased from 3% in 1989 to 13% in 1995.[19]

The available evidence indicates that the majority of strategic partnership agreements were concluded between companies from the developed countries with more than a half of the agreements being concluded between firms based in the same country. A great part of all these agreements -

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[17]Even by excluding strategic R and D partnerships; see: UNCTAD, World Investment Report 1997, Geneva: United Nations Publications, 1997, p. 12. This information is based on data by IFR Securities Data Company and J. H. Haagedorn, (1996). "Trends and patterns in strategic technology partnering since the early seventies", *Review of Industrial Organization*, 11, pp. 601-616.

[18]UNCTAD, World Investment Report 1997, p. 12.

[19]Ibid. p.14.

according to some sources about one half - are concentrated in the information technology sector with the rest mainly found in biotechnology, new materials and automobile industry (see Box 2).

Box 2

Strategic alliances in information technology involving developing country partners

Using the information technology strategic alliances (ITSA) data base which records publicly announced inter-firm alliances in information technology (IT) around the world, Nicholas et al. (1997) found that 2,301 of those records involved at least one partner from a developing country or an economy in transition which represents about 10% of the total records over the period 1984-1994 (increasing from 6% in 1988 to 12.8% of total alliances in the IT sector in 1994). R and D agreements involving developing country firms doubled in 1989-1990 and doubled again in 1993-1994, reflecting the capacity of developing countries in the development of new technologies. The same source found that the significant rate of growth in inter-firm alliances in IT during the period 1984-1994 were surpassed by rates of growth of alliances involving developing country partners. The non-technology partnerships, involving only marketing and distribution remained at low levels, not exceeding 25% of the total since 1988. On the other hand, 75% of the alliances with developing country firm participation had explicit technological content. Among other non-OECD countries that mostly participated in these alliances are NICs and transition economies.*

What requires further examination is the extent to which different modalities of inter-firm cooperation have contributed to technology capacity-building, promotion of innovation, enterprise development and increased competitiveness of developing countries and transition economies.

**Source:* Nicholas, S., Vonortas, N. S. and Stratos P. Safioleas (1997). "Strategic Alliances in Information Technology and Developing Country Firms: Recent Evidence" in *World Development*, vol. 25, No. 5.

In biotechnology large pharmaceutical companies have entered into a substantial number of cooperative agreements with small dedicated biotechnology firms through minority share holdings, R and D contracts and licensing agreements. In information technologies, on the other hand, unidirectional technology flow is the second most popular form of cooperation, largely due to second-sourcing agreements. In the production of new materials, joint ventures, unidirectional technology flow and joint R and D each account for about 25% of the total agreements.[20]

Inter-firm agreements involving firms from developing countries are

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[20]Hagedoorn, J. and Schakenraad, J. (1990) "Inter-firm Partnerships and Cooperative Strategies in Core Technologies" in Freeman, C. and Soete, L. (eds.), *Perspectives in Industrial Economics*, Kluwer, Dordrecht.

primarily contractual in nature; joint ventures, and equity investments are the predominant forms of these alliances. The little research currently available suggests that some firms from developing countries have gained significant benefits from these strategic partnerships not only in terms of accessing more advanced technologies, but also by acquiring the capacity to develop such technologies on their own. The firms from industrialized countries entering into such partnerships appear to do so in order to gain access to markets, low-cost production sites and even low-cost technology development sites in the developing world, and also to spead the costs and risks of innovation.[21]

The data in table 2 show that the East Asian firms have been particularly active in entering into alliances in the field of information technology. Asian firms (excluding the Asian republics of the former Soviet Union) accounted for 61.6% of the total for firms of developing countries and transitional economies. Firms in Eastern Europe and the former Soviet Union accounted for 21.2%, Latin American firms for 15.5% and African firms for 0.2% of the total of alliances listed.[22]

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[21]Nicholas, S., Vonortas, N.S. and Safioleas, S.P. (1997). "Strategic Alliances in Information Technology and Developing Country Firms: Recent Evidence", *World Development*, vol. 25, No. 5, pp. 657-680.

[22]African firms including South Africa accounted for 1.2%.

Table 2

Strategic alliances in information technology (IT) - participation of developing countries and transitional economies (1984-1994)

Country	*Number*
Former Soviet republics	294
People's Republic of China	270
Hong Kong	247
Republic of Korea	239
Taiwan Province of China	179
Mexico	165
Singapore	158
India	105
Israel	105
Hungary	80
Brazil	80
Poland	77
Thailand	74
Malaysia	60
Czech Republic	49
Other Latin American*	45
Argentina	42
Turkey	38
Philippines	33
Indonesia	33
Chile	31
Africa	27
Saudi Arabia	26
Venezuela	23
Bulgaria	20
Other Eastern European*	17
Colombia	16
Viet-Nam	14
Romania	13
Egypt	10
Pakistan	7
South Africa	5
Iran	5
United Arab Emirates (UAE)	4
Iraq	3
Jordan	2
Albania	1
Cyprus	1
Total	2,598

Source: ITSA database as given in Nicholas, Vonortas and Safioleas (1997), p. 663, op. cit.

* Countries of the region which have not been listed individually in this table.

II. Implications of inter-firm cooperation for competitiveness and technological capacity-building

This section deals with the merits of clustering, networking and partnering. Taking a development perspective, it focuses on the contribution to strengthening technological capacity-building, promoting innovation and improving enterprise development and competitiveness.

One of the most important factors motivating companies to enter cooperation arrangements with other companies has been the prospect of being able to innovate and thereby strengthen the company's competitive potential. Inter-firm cooperation increases the adaptability of entrepreneurs to changing conditions which, in turn, is one of the major factors in the adjustment of economies to a new competitive environment.[23] *Innovation* and *technological capacity-building* are key issues behind the trend toward inter-firm cooperation.

In the context of this report, *innovation* is understood broadly as the ability to adjust, to introduce new technical processes and organizational improvements; it is essential for the survival of any social and economic system. Innovation is profoundly affecting technological competitiveness in virtually every branch of the world economy. Most industrialized countries have gone to great lengths in their efforts to develop industrial and technology policies that enable their enterprises to maintain a competitive edge. Many developing countries are trying to follow a similar path within their respective financial and infra-structural set-ups and often limited resources. Some of these, such as the newly industrializing countries of the Asia/Pacific region, have already done so with great success. However, many others still struggle to put in place a strategy that is feasible, sustainable, and promotes enterprise development. At the same time, economies in transition are seeking ways of restructuring their innovation system against the background of privatization and a lack of exposure to market mechanisms and international competition. In this context, *technological capacity-building* including the development of human resources, organizations, institutions and the technologies themselves, is a major prerequisite for increasing enterprises' productivity and for countries to compete on international markets.

Clearly the merits of partnering will not be the same for all countries and enterprises. The benefits of inter-firm cooperation will depend on, *inter alia*, contextual factors, such as specific local, social, cultural factors, policy elements and the general development of the enterprise sector in the respective country. Recent research has found, however, that "the presence of strong inter-firm production relations, the presence of active business associations and occasionally strong support by the state generally has a positive association with growth dynamism. A strong sociocultural milieu can

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[23] Arzeni, S., Pellegrin, J. P. (1997). "Entrepreneurship and local development", *OECD Observer* No. 204; Claudio Ciborra (1991). "Alliances as Learning Experiments: Cooperation, Competition and Change in High-Tech Industries", p. 11, in Mytelka, L.K. (1991), *Strategic Partnerships: States, Firms and International Competition*, op. cit.

be of further help...".[24] Yet, while there are more and more cases supporting this observation, there is still an absence of uniform and quantifiable measures that could be applied to all cases.

A. Clustering

Clustering becomes important because it could facilitate specialization and gradual investment in small steps. Producers do not have to acquire equipment for the entire production process, they can concentrate on particular stages leaving other stages to other entrepreneurs. Specialized workshops which can repair and upgrade existing machinery are of further help in the production process; where specialized suppliers of raw materials and components are close by, there is also less need for large inventories which are costly to maintain.

Once a cluster is formed, the whole group of firms could become mutually supporting, with benefits flowing forward and backward. Aggressive competition in one industry tends to spread to others in the cluster, through the exercise of bargaining power, spin-offs, and diversification by established firms. Entry of other firms into the cluster spurs upgrading of the industry by stimulating diversity in R and D approaches and providing a means for introducing new strategies and skills. The diffusion of information and innovations is accelerated through suppliers or customers who have contact with multiple competitors, and the interconnections developed within the cluster lead to perceiving new ways of competing and new opportunities.[25] As a recent analysis of the Danish wooden furniture industry concluded "...proximity matters. An individual economic activity is embedded in a networked structure of customers, suppliers, competitors and institutions. This very structure provides both the pressure and the enabling resources for knowledge upgrading and innovations defined in a broad sense. Product innovations, new forms of organization or new skills are arrived at in interactive processes within such industrial systems".[26]

Some clusters have succeeded to establish/insert themselves into marketing channels and to develop a capacity to respond to changes. Demands of new customers are higher in terms of standards, nature of products and delivery. "If local institutions (private and public) are strong, clusters can move into new market niches, extend the span of their activities within the commodity chain or develop new links to final markets".[27] As clusters develop, they increasingly attract resources in the economy and away from

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[24]Nadvi, K. and Schmitz, H. (1994). "Industrial Clusters in Less Developed Countries: Review of Experiences and Research Agenda", Institute of Development Studies, Discussion Paper 339; January, p. 53. See also IDS Policy Briefing, Issue 10, April 1997.

[25]In M. E. Porter's view, people and ideas combine in new ways, and Silicon Valley provides a good example of the effects of clusters. Porter, M. E. (1990), p. 151.

[26]Malmberg and Maskell, op.cit. p. 21.

[27]Humphrey J., Schmitz H., (1996). "The triple C Approach to Local Industrial Policy", *World Development*, vol. 24, No. 12, pp. 1859-1877.

industries which do not deploy these as productively. Ultimately, national competitive advantage would reside as much at the level of the cluster as it does in individual industries; this may have important implications for government and enterprise strategies.[28]

Box 3

The diversity and complexity of experiences with clusters

In recent years, the notion of clustering has been subject to a number of studies and much debate. Although extensive case studies describing the emergence of clusters at very different national and regional levels have brought the concept of clustering closer to decision-makers and entrepreneurs, often underlining its attractive and applicable patterns, there is still no preset formula for a successful cluster.

The increased popularity of clusters is mainly due to the results in increased performance, their contribution to collective efficiency and, ultimately, their facilitation in accessing international markets. Many clusters have proved to be successful, and are considered possible models for potential clusters in developing countries. The Italian clusters are much cited. So are the Brazilian ones, concentrating on the footwear industry, and which have made Brazil today a major shoe exporter. Pakistan is a leading manufacturer of surgical instruments thanks to clusters in the Sialkot region. Clusters in Ghana and Nigeria also show success.

However, these clusters do not all follow the same production techniques, nor the same strategies, and they clearly do not represent methodologically comparable experiences, nor have they evolved in comparable contexts. Different industries in such clusters, therefore, do not necessarily share the same degree of collective efficiency and comparative advantage derived from cooperation.

Source: Van Dijk, M. P. and Rabellotti, R. (eds.) (1997) "Enterprise Clusters and Networks in Developing Countries" Frank Cass, London in association with The European Association of Development Research and Training Institutes (EADI), Geneva, and UNCTAD (1994). "Technological Dynamism in Industrial Districts: An Alternative Approach to Industrializaiton in Developing Countries? (UNCTAD/ITD/TEC/11). See also Nadvi, K. And Schmitz, H. "Industrial clusters in less developed countries: review of experiences and research agenda", IDS Discussion paper, No. 339.

B. Networking

A characteristic of a production system based on networking particularly between clients and suppliers is its flexibility, which not only enhances product characteristics but may also reduce production costs. There is emphasis on better quality with total quality-control procedures and on reducing inventory costs with just-in-time production organization. Production depends on customer orders: the system must be able to give a rapid

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[28]Porter, M. E. (1990), p. 152.

response to demand. It implies a new labour organization: flexible work teams, which are able to perform a higher number of tasks and are organized in small production cells, with a flatter hierarchical structure. The growth of small, independent, but interdependent firms has proven a vital element in the adjustment of economies to a new competitive environment. The creation of networks of firms responds to the idea that contacts and cooperation with other firms may be a way for a small or medium-sized enterprise to solve its problems and that this mutual learning process could be facilitated by some kind of external assistance and brokerage. Networks, for example, could regroup similar SMEs which aim at exporting their goods or occupying a new market, or they could share the R and D burden. Other networks consist of different firms from different sectors, aiming to find complementary activities in the development of a new product. A third type consists of associations geared to solving a common problem or exchange technology information.[29]

The efficiency of networking is allowed by simultaneous cooperation and competition which bring about rapid spread of ideas and improvement of performance. Networking is based on constraints and advantages: all members should be able to meet new standards emerging from cooperation, in other words to incorporate new technology, resolve commercialization problems and invest in human resources. Concerning advantages, firms participating in a network can benefit from emulation and exchange of information.

C. Inter-firm agreements including strategic partnerships in R and D

So far, the analysis of experiences with inter-firm cooperation has concentrated on partnerships among firms in developed countries. However, recent evidence suggests that a number of inter-firm agreements are of importance to developing countries. Two kinds might be highlighted: (a) those related to the objectives of cost reduction; in this respect, it may be advantageous for a firm from a developed country to find a partner in a developing country when the product cycle is already at a well-developed stage. Such an alliance may take the form of a linkage with the components' suppliers, which may be more or less stable and of a long-term nature. Subcontracting, original equipment manufacturing (OEM) and second-sourcing agreements with a variety of input suppliers are possible examples; (b) those related to product development for "niche" markets.[30] A product development alliance, directed towards the creation of a "niche" market, may represent a mutually interesting strategy since it is not a zero-sum game; this is because new products attract new customers without threatening existing customer bases. New product development adds branches to the underlying cycle of a product class, and increases overall industry profits. An additional advantage is the fact that exploiting "niches" in the domestic market may provide a possibility of learning with regard to the development of new products that

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[29]Arzeni S., Pellegrin J.P., 1997, op. cit.

[30]Mody, A. (1989). "Changing Firm Boundaries: Analysis of Technology-sharing Alliances", *Industry and Energy Sharing*, Department Working Paper, Industry series paper, World Bank, No. 3, Washington, D.C.

become internationally competitive in due course.[31]

Other forms of inter-firm collaboration include *joint ventures, joint research and development or co-developments, subcontracting, parts and component supplier networks, OEM* and *consortia*. Some cases suggesting benefits that developing country firms might obtain through partnering are presented below.

The example of a North-South *joint venture* in box 4 shows that there has been a gradual learning process and that, through the setting up of a product development centre, not only training, but the opportunity for innovating and strengthening technological capacity are being improved.

Box 4

Shanghai Volkswagen Automotive Co. Ltd. (North-South)

Shanghai Automotive Co. Ltd. is a joint venture between Volkswagen of Germany and Shanghai Automobile Industry of the People's Republic of China, established in 1984 to manufacture cars with Volkswagen's technology. Its cars have captured more than 52% of the market share of cars made in China. By the end of 1996, the local content rate of the model Santana B2 had increased to 90.5% from 2.7% in 1985, and the latest model Santana 2000 has increased its local content from 60% in 1995 to 80% in 1996. The joint venture became the first Chinese automobile company to achieve ISO 9001 quality certificate in 1996. To sustain its lead in this sector, the joint venture is expanding its Product Development Centre at a cost of US$ 120 million. Through such a centre the local firm will have an opportunity to learn to innovate further expanding its technological capacity.

The objective of *joint R and D development* is to complement each other's resources and save on development costs and time and thereby enhance the competitiveness of the partners and strengthen their technological capabilities (see box 5 on a South-North arrangement).

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[31] UNCTAD (1996). Emerging Forms of Technological Cooperation: the Case for Technology Partnership (UNCTAD/DST/13).

Box 5

Biocon India Pvt. Ltd. (South-North)

Biocon India Pvt. Ltd. was established in 1978 as a joint venture between an Indian woman scientist and a biotechnology company from Ireland called Biocon Biochemicals Ltd. The Irish company held 30% of the equity and the Indian partner 70%. In 1989, Biocon Biochemical Ltd. and its subsidiaries were acquired by Quest International of Netherlands, a wholly-owned subsidiary of Unilever. Biocon India is mainly in the business of developing and manufacturing industrial enzymes. It has built a strong R and D base with an initial focus on solid substrate fermentation, which is now expanded to include submerged fermentation, recombinant DNA technology and bioreactor design.

The R and D aspect represented an important collaborative effort between Biocon India and Biocon Biochemicals of Ireland. Most of the work was carried out in India because of the relatively better experience of Biocon India in this area of technology. Most of the work carried out in Ireland related to that of testing the new enzymes for their efficacy, suitability for plant scale production, performance, etc. By 1989, Biocon India had built up substantial expertise in this field and also became strong in production technologies of certain enzymes and has developed certain unique strains and process technologies through its in-house R and D. So, Quest International formed an alliance with Biocon India to develop some new products exclusively for them. These products are marketed by Quest International worldwide and Biocon India has the exclusive rights to market them in India. When the results of the research are patentable, the rights will be jointly held both by Biocon India and Quest International. In the case of products where the process facilities at Biocon are not suitable for taking up large-scale manufacturing, Biocon India transfers the know-how to Quest International's manufacturing sites abroad. In both cases, Biocon India receives royalties from Quest International.

While Quest international gains access to the expertise of Biocon India and new products at lower costs than conducting its own R and D, the latter also benefits in several ways. For instance, Biocon India's knowledge of patenting and its procedures was limited, but now with the help of Quest International it has built up its knowledge in these issues. Biocon is also gaining access to the global networks of Quest International. Quest is also helping Biocon India to acquire global market knowledge for its own products. Biocon India retains 70% of the equity of the joint venture.

Source: Reddy, P. (1996), "Emerging Patterns of Globalization of Corporate R&D and Implications for Innovation Capability in Developing Host Countries - The Case of India". Ph.D. Thesis. Aalborg University, Denmark.

Subcontractors are increasingly drawn into joint research and collaboration in the design of new products or components. They are persuaded to assume additional responsibility for the manufacture of not just parts and components, but the whole modules which are to be assembled into complete products or systems by their customer.

Parts and components supplier networks provide opportunities for strategic partnerships with SMEs. These need not be high-technology or newly established firms, but are mostly existing firms active in related product areas and/or may already produce the relevant component but need to upgrade the quality to meet the standards required to be accepted as a supplier to foreign firms.

Customer firms of OEM offer technical assistance in engineering and manufacturing processes in order to ensure quality and cost efficiency. Moreover, the customer takes responsibility for marketing and distribution, saving the OEM supplier substantial investments in those areas. The SME may, however, become dependent on the OEM relationship and not progress towards developing its own independent brand name and marketing channels.[32]

While patents and copyrights are important objects of *licensing*, it has become a trend in recent years for firms to choose to provide selectively to outsiders proprietary tacit knowledge that is not legally protected. One of the newer and most distinctive forms of licensing in the electronics industry has been the "second-source" licensing, where a firm licenses a product to one or more additional manufacturers because the customers do not want to depend solely on a single source of supply. Second-source licensing is a much less costly and risky way for firms to enter the microprocessor market than designing their own chips. Samsung is a second source for the Precision Architecture (PA) RISC chips of Hewlett-Packard, with whom it has a joint venture in the workstation market.

Box 6

Example of technology licensing

Samsung of the Republic of Korea became a leader in DRAM technology by pursuing alliances with the world's leading manufacturers and became the first South Korean firm to offer 4Mb DRAMS in 1990 and 16Mb DRAM in 1992. It has entered into an alliance with Toshiba to design, develop and manufacture flash memories with both firms seeking to challenge Intel's dominance in this market. In other semiconductor areas, Samsung continues to build up its strengths through technology exchanges and agreements including a mutual semiconductor patent swap with IBM, a general cross-licensing agreement with Fujitsu, an exchange of SRAM technology for ASIC technology with NCR, a co-development project with Motorola to develop a personal computer range.

Source: Chen, 1993. ICE, 1993. Chen, C. F. and Sewell, G. (1996) "Strategies for Technological Development in South Korea and Taiwan: the Case of Semiconductors" in *Research Policy* 25, pp. 759-783.

In a *consortium* there are more than two partners; usually it is formed on a project/product-specific basis. In consortium activities the quantum of benefits that a consortium's partner derives is proportional to its

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[32]Ernst, D., Ganiatsos, T. and Mytelka, L.K. (1998). *Technological Capabilities and Expert Success in Asia*, Routledge, forthcoming.

contribution to the pool. By pooling the complementary resources of different partners, a consortium enhances the competitiveness of the group by saving on time and costs and thereby enhances the technological, financial and managerial capabilities of the firms as a group.

III. Policy considerations and issues for further research

Inter-firm cooperation takes place largely at the initiative of the firms themselves driven by market forces. However, such cooperation becomes viable only when the policy environment is conducive. This section deals with policies that foster and sustain inter-firm cooperation in different forms (e.g., clusters, networks, and strategic partnerships). Such policies become effective in appropriating the benefits of inter-firm cooperation, when enacted and implemented at different levels in a coordinated manner. These different, but interlinked and often overlapping levels are: (i) the government (macro level); (ii) the intermediaries, (meso level) e.g., chambers of commerce and industry, regional governments, universities, etc.; and (iii) the enterprises (micro level).

A. At the government level

When discussing policies or policy implications of inter-firm cooperation, the most important factors appear to be the consistency and stability of policies and the government's decision to retain the chosen policy framework. Sudden and unforeseen changes that are inconsistent with past policies can be a threat to decisions which need a long-term perspective. The macroeconomic framework has a significant effect on local partners as well as foreign enterprises in decisions relating to inter-firm cooperation and industrial development. Enterprises with already satisfactory levels of managerial, marketing and technological capabilities can be claimed to be attractive partners in an inter-firm cooperation and, in turn, they are likely to be able to benefit more from the opportunities that collaboration offers.[33] The institutional framework is crucial for the dynamic process of learning and for the development of technological capacities. Thus, the conditions for inter-firm cooperation relate to the important role of policy in this development. Adequate incentives can justify the effort needed to cooperate, for example, with the objective to adopt technology and master it. Furthermore, an indispensable factor in the development of cooperation is investment in capabilities to increase human capital, develop specialized skills and improve the organization of production and marketing.

Clusters emerge and grow naturally, often without any government intervention, e.g., the beginning of Silicon Valley in the United States or of the software industry in Bangalore, India. Once a cluster begins to form, government at all levels plays a vital role in sustaining it through investments to create specialized factors, such as university technical institutes, training centres, data banks, and specialized infrastructure.[34] New clusters have been built around a concentration of specialized expertise; internationally leading domestic industries are often linked to specialized

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[33]UNCTAD (1996). Emerging Forms of Technological Cooperation: the Case for Technology Partnership (UNCTAD/DST/13), p. 42.

[34]Porter, (1990), p. 655.

research institutes or university departments, located in close proximity. Governments have played a major role in setting up, for example, technopoles, science parks or export processing zones. The lessons learned are mixed: while some of these experiences have been successful, such facilities do not automatically lead to networking and partnering.[35]

Another important determinant in the creation and success of inter-firm cooperation is the legal framework governing business and inter-firm transactions and collaboration. This includes the definition of, for example, the system of property rights and their enforcement, contract law, commercial law and bankruptcy procedures.[36] For inter-firm alliances, particularly for technological alliances, the intellectual property regime must be set in accordance with the international practices. It is not sufficient to have laws, but their enforcement must also create confidence in the firms and their foreign partners.

B. At the level of intermediaries

Various types of institution, situated at an intermediate level between the macroeconomic framework and individual enterprises can contribute to the creation of inter-firm cooperation by assisting in bringing potential partners together, disseminating information, and building the mutual confidence necessary for any agreement. Institutions at the meso level, such as trade associations and regional governments play an important role in many nations in funding and even creating such specialized research institutions. Other institutions that might play an important mesoeconomic role and promote strategic partnerships are non-governmental organizations, acting as an institutional mechanism to increase the level of mutual confidence among partners, and at the same time supplying a variety of real services, training and technical assistance.[37]

Internationally successful industries and clusters have a tendency to concentrate in a region, and the factors of competitive advantage are often highly local. At the regional level, therefore, the role of state and local governments is an important one, particularly in areas such as university and technical education, service infrastructures, specific research initiatives and programmes, as well as explicit support at the level of the regional authorities.

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[35]See, for example, Luger, M. and Goldstein, H. (1991). *Technology in the Garden: Research Parks and Regional Economic Development*, Chapel Hill, University of North Carolina; UNCTAD (1994). Universidad y Empresa en un Nuevo Escenario Competitivo (UNCTAD/DST/1) (and Conclusions and Recommendations of the Latin American Workshop of Experts and Coordination (UNCTAD/DST/1/EXCERPT)); Vavakova, B. (1988). "Technopoles des exigences techno-économiques aux orientations culturelles", in *Culture technique*, No. 18 and Tatsuno, S. (1986). *The Technopoles Strategy: Japan, high technology and the control of the 21st Century*, New York: Prentice Hall.

[36]UNCTAD, (1996), p. 28.

[37]UNCTAD, (1996), p. 29.

Box 7

Policy scheme from Ireland

A programme to upgrade the technological capabilities of domestic SMEs was adopted by the Irish scheme "Technology Acquisition Grants (TAGs). Grants offered to enterprises to cover directly incurred costs on licensor fees; licensee costs, and consultancy fees. To take advantage of the scheme, among others, a firm's project must: (i) involve a reasonable degree of innovation relative to the company's existing level of technology; (ii) have a reasonable prospect of commercial success; (iii) the product/process must be produced or applied within the country; (iv) the parties to the license agreement must be independent entities; and (v) the company must provide a brief history and an indication of their product development plans as well as an assessment of the commercial and technical viability of the project. In addition to this scheme, there are a number of agencies involved in promoting and servicing the licensing and joint venture aspects of technology transfer at both the national and regional level, including a number of private-sector intermediaries.

Source: O'Doherty, D. (1990), p. 309.

Building up knowledge centres in developing and transition economies could also contribute to the process of inter-firm cooperation through, among others, attracting foreign firms to enter into alliances with local universities and firms. These would help broaden the knowledge-base of the economy and contribute to enterprise development. The promotion of joint R and D programmes together with the firms and academic establishments fosters inter-firm collaboration with knowledge spillovers to the rest of the economy.

C. At the enterprise level

Under the circumstances, where technologies are changing rapidly and product life cycles are being shortened, innovation has become a key competitive strength. However, the development of new technologies increasingly require diversified inputs from several different disciplines. It is becoming difficult for a single firm to muster all the resources required to be innovative and competitive in the global markets. Therefore, firms are aligning themselves with others, including competitors, with complementary capabilities or resources. Such complementary resources could be in innovation, organizational or marketing knowledge, or financial resources. Hence, to be able to participate in inter-firm alliances, the firms need to possess some initial strength. Government policies may focus on building such critical capabilities among the domestic enterprises. Such policies include provision of incubator facilities, financial and other guarantees on behalf of the domestic enterprises seeking to participate in global alliances. Provision of venture capital to newly emerging innovative firms may also attract international firms to collaborate with the domestic firms.[38]

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[38]See also Part III A.

Technology capability building needs firm-level focused efforts to develop. However, firms cannot be competitive alone; they need linkages to other actors of the innovation system. Policies and institutions at different levels can play a critical role in enhancing this process. This emphasizes the importance of policies to increase the supply of human capital, and science and technology and R and D infrastructures, which by enhancing technology capability will directly result in the promotion of inter-firm cooperation.[39]

D. Areas and issues for further research and technical cooperation

Most of the research conducted so far on inter-firm cooperation (clusters, networks and strategic partnerships) has been carried out from the perspective of developed countries. Considering the available cases, it would now be important to bring in the perspective of developing countries and transition economies, through studies of clusters (industrial districts/technology parks), networks and strategic partnerships (between firms in the same country as well as between domestic and foreign firms) in developing countries to understand the driving forces, processes and results of such inter-firm cooperation. In this connection, the following questions, by no means exhaustive, would be of policy relevance:

(i) Formation and development of clusters and networks

(a) How are clusters formed - what are their roots, growth paths - particularly in developing countries and transition economies? Where they have emerged, how different are their forces, processes and agglomeration effects from those in developed countries? Since there are examples of such clusters in several developing countries, an in-depth study of factors and conditions enhancing clustering processes and the effects on competitiveness and technology capability building could be a useful undertaking.

(b) In what ways do formal and informal institutions further the collective interests of the cluster? What roles did local, public- and private- sector institutions play in the cluster's development?

(c) Do these clusters have within their confines a range of producer firms; a network of suppliers of materials, equipment, spare parts, repair services, traders, export agents and other producer services?

(d) What are the characteristics and effects of networks formed by domestic SMEs in a developing country? What are the differences with the networks formed with larger firms and multinational corporations?

(e) Has process specialization developed within the cluster? Has this resulted in vertical chains of production? Also, are there signs of horizontal collaboration? Has it resulted in, for example, technical upgrading, joint marketing or the formation of local business associations?

(f) Under which general and specific conditions does a cluster achieve viable economic growth?

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[39]UNCTAD, (1996), p. 29.

(g) Why and how does clustering increase the capacity of firms to adapt and respond to opportunities and shocks?

(ii) Sustaining partnership

(h) Assuming that more extensive research will show that firms in developing countries, like their counterparts in the North, may benefit from partnering activity, what basic conditions must exist in order to motivate companies to engage in partnerships and other forms of inter-firm agreements (e.g., in legal terms, intellectual property rights, long-term security for investments made in a foreign country, tax,general and regional policy framework)?

(i) What are the driving forces and motivating factors behind strategic partnerships between firms in the North and the South and how do these differ from South-South partnerships?

(j) What are the implications of partnering and networking for competitiveness and technological capability of firms from developing countries and transition economies in the short and long term? Does inter-firm collaboration bring about a sharing of technical knowledge and encourage patterns of local technical learning? Has this advanced product and process development? What effects will strategic partnerships with firms from the industrialized countries have on these firms considered to be potential competitors in the international markets in the long-run?

(k) What types of technical cooperation and assistance are likely to facilitate clustering, networking and strategic partnerships?